

Effect of Educational Intervention as Cognitive Behavioural Therapy for Intake of Junk Food, Sugar-sweetened Beverages and Energy Drinks among Medical Students from India: A Prospective Interventional Study

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ABSTRACT

Introduction: Junk food intake has increased many folds in the last two decades. India is still struggling with communicable diseases, though the incidence of non communicable diseases, including metabolic syndrome, has increased several times in the younger age group. There is a scarcity of data and a limited number of international studies on decreasing junk food intake, especially in India.

Aim: To assess eating habits, nutritional status, and the effect of behavioural therapy on junk food intake in medical undergraduate students.

Materials and Methods: A prospective interventional study was conducted in medical students of a tertiary care hospital in Northern India (Faculty of Medicine and Health Sciences, SGT University, Haryana, India) over a duration of six months, from October 2021 to March 2022. All students were given a pretest in the form of an electronic questionnaire. Students then received four educational sessions based on Cognitive Behavioural Therapy (CBT), one session per week, each lasting 30 minutes. At the end of the four sessions, all students were assessed through a post-test following the same protocol as the pretest. Statistical

analysis was conducted using Statistical Packages for Social Sciences (SPSS) version 28.0. The Wilcoxon's signed-rank test was applied for comparison within pre and post-interventions.

Results: Most of the students, 302 (68%), included in the study were less than 20 years of age, with a minimum age of 17 years and a maximum age of 25 years. A total of 443 students were included in the study. Of these, 178 out of 443 had a Body Mass Index (BMI) >25 kg/m², classifying them as overweight (40.18%). The majority of students were not aware of the major side effects of junk food intake, but a significant improvement was noted in the post-test conducted four weeks later. A significant change ($p < 0.0001$) was observed in the frequency of intake of junk food, sugar-sweetened beverages, and energy drinks, decreasing significantly after the four educational sessions.

Conclusion: Short educational intervention programs, as part of cognitive-behavioural theory, have a significant impact on improving awareness and reducing the intake of junk food. More studies of longer duration and involving other components of CBT should be conducted to assess their impact on physical and mental health.

Keywords: Communicable disease, Health education, Metabolic syndrome

INTRODUCTION

Junk food and sugar-sweetened beverages intake in children and adolescents have increased several-fold in the last few decades [1,2]. The definition of junk food has varied widely in different sources, until recently, when the Indian Academy of Paediatrics (IAP), in its latest guidelines, defined junk food with the new terminology 'JUNCS' as follows: J - Junk foods (foods high in fats, especially saturated and trans-fats, sugars, and salts, and foods lacking in micronutrients/minerals), U - Ultra-processed foods (as defined in the fourth category of NOVA classification), N - Nutritionally inappropriate foods. Homemade foods can also qualify as nutritionally inappropriate if prepared in recycled oil or contain high amounts of sugar, fat, or salt. C - Caffeinated/coloured/carbonated beverages, S - Sugar-sweetened beverages [3].

A Pan-India survey by Centre for Science and Environment (CSE) in children aged 9-17 years shows consumption of Sugar -sweetened Beverages (SSBs) (92%), salt packaged food (94.3%), and sweet packaged food (95.1%) in more than nine out of 10 children [3,4]. Similarly, a study to assess junk food consumption among medical students in Karnataka showed almost 100% of students consuming JUNC food at times, with 16% consuming it on more than five days

per week. These figures were noted despite the fact that almost 87% of students were aware of the major side effects [5].

The reasons for the same remain plenty; being tasty, readily available, low cost, attractive, non availability of home food at the right time due to working parents, urbanisation, and the rising Western culture are just some of them [6,7]. A rise in the intake of energy drinks has also been recorded in young adolescents [8]. The rising intake of these food items has led to several negative effects on health, such as obesity, dyslipidemia, metabolic syndromes, dental caries, and psychiatric illness [9-13]. Considering these facts, the Indian Academy of Paediatrics released its national guidelines on fast and junk foods, sugar-sweetened beverages, fruit juices, and energy drinks [3]. The development of correct eating habits in primary years helps in maintaining lifelong eating habits and good health, but intervention in late adolescents and early adulthood may at least prolong the onset of these diseases. The knowledge conveyed to students through the educational interventions was based on the recently released guidelines by IAP for children and adolescents up to 18 years of age [3]. To date, Indian studies assessing the effect of these behavioural interventions in this age group are grossly lacking. With the rising burden of obesity and metabolic syndrome in young adolescents, the present study was undertaken to assess the effect

of educational intervention on the intake of unhealthy food (JUNCS) in medical undergraduate students. The aim of the study was to assess eating habits, nutritional status, and the effect of behavioural therapy on junk food intake in medical undergraduate students.

MATERIALS AND METHODS

It was a prospective interventional study carried out in medical students at a tertiary care hospital in Northern India (Faculty of Medicine and Health Sciences, SGT University, Haryana, India), in the age group of 17-23 years. The study was conducted for a total duration of three months, from October 2021 to March 2022. Ethical clearance was obtained before the start of the study (letter no. SEC/FMHS/25/7/2022/79).

Inclusion criteria: The inclusion criteria included all students enrolled in the Bachelor of Medicine and Bachelor of Surgery (MBBS) course who consented to participate in the study.

Exclusion criteria: The exclusion criteria included students who did not attend any of the sessions (pretest, post-test, intervention lectures), those with any pre-existing medical illness, or undergoing treatment for it.

Study Procedure

All students were given a pretest in the form of an electronic questionnaire sent to their individual gadgets. The questionnaire was created after an extensive literature search based on the Indian Academy of Paediatrics guidelines on fast and junk foods, sugar-sweetened beverages, fruit juices, and energy drinks, as well as the theory of CBT. Each question was individually assessed to determine changes in answers before and after the intervention, along with their frequency and percentages. These percentages were calculated using the statistical test Wilcoxon's signed-rank test for before and after the intervention. The nature of the data collected was qualitative, so it was primarily compiled as frequencies and percentages.

The questionnaire included demographic details, including socioeconomic status (calculated as per the modified Kuppuswamy scale [14]), awareness of unhealthy foods (comprising JUNCS), and behavioural intentions towards the intake of these foods. There were a total of 39 questions in English. The questions covered knowledge regarding junk food, sugar-sweetened beverages, and energy drinks, behavioural intentions regarding the intake of these products, and possible health effects after consuming these products. The definitions and categorisation of food items under these headings were based on the Indian Academy of Paediatrics Guidelines on Fast and Junk Foods, Sugar-sweetened Beverages, Fruit Juices, and Energy Drinks [3]. The questionnaire was pre-validated in 30 subjects, and the Cronbach alpha score was 0.85.

The data were collected in the presence of a third person not involved in the study, ensuring that individual identities were not revealed during the pretest or post-test physically or via the proformas. Students then received four educational sessions, one session per week, each lasting 30 minutes, conducted by a certified nutritionist and researcher trained with them. Students were classified as underweight (<18.5 kg/m²), normal (18.5-22.9 kg/m²), overweight (23-24.9 kg/m²), or obese (>25 kg/m²) based on the World Health Organisation guidelines and Asia Pacific guidelines [9].

Although the in-person educational sessions were a total of four, each lasting 30 minutes, the educational information provided was almost continuous over most days. The sessions were conducted using a flipped classroom method, where authors circulated the educational material for each class three days prior to the session. The materials sent were in the form of pre-made videos and written material, prepared according to the IAP guidelines on fast and junk foods, sugar-sweetened beverages, fruit juices, and energy drinks, in consultation with a certified nutritionist from the Institute. The sessions

included knowledge about unhealthy foods, their impact on physical and mental health, and methods to decrease the intake of junk food, sugar-sweetened beverages, and energy drinks. At the end of the four sessions, all students were assessed through a post-test using exactly the same protocol as the pretest after four weeks.

STATISTICAL ANALYSIS

A master chart was prepared using MS Excel 2010. A bar graph was used for discrete or ratio and percentage forms of data, and statistical analysis was conducted using SPSS version 28.0. The Wilcoxon's signed-rank test was applied for comparisons within pre and post-interventions. A p-value of <0.05 was considered significant.

RESULTS

A total of 600 MBBS-enrolled medical students were screened for the study, of which 443 students were finally included in the study after applying the inclusion and exclusion criteria. Most of the students, 302 (68%), included in the study were less than 20 years of age, with a minimum age of 17 years and a maximum age of 25 years. All students belonged to the upper-middle or upper socioeconomic class. Out of the 443 students, females numbered 274 (61.8%), outnumbering males at 169 (38.1%). There were almost an equal number of students who were hostellers as compared to day scholars [Table/Fig-1]. A total of 178 (40.1%) students had a BMI >25 kg/m², categorising them as overweight or obese.

Variables		Percentage n (%)
Age	<20 years	302 (68%)
	>20 years	141 (31.8%)
Gender	Male	169 (38.1%)
	Female	274 (61.8%)
Place of residence	Hostel	219 (49.4%)
	Home	224 (50.5%)
BMI	<18.5 kg/m ²	127 (28.6%)
	18.5-22.9 kg/m ²	164 (37.%)
	23-24.9 kg/m ²	74 (16.7%)
	>25 kg/m ²	178 (40.1%)

[Table/Fig-1]: Demographic status.

Upon further evaluation of the awareness of these young medical students regarding junk food, it was found that almost 137 (30%) children were not aware that eating junk food can be harmful to health. The majority 361 (81.49%) of them thought that vitamin and mineral deficiencies were the only side-effects. Less than 112 (25.28%) children knew that the intake of such food can raise blood pressure, cause dental caries, or be a common reason for obesity. After the four-week intervention period, almost 421 (95.03%) children became aware of the most common risks or side-effects associated with the intake of junk food.

It was observed that the intake of junk food was noted as 'most days of the week' (defined as more than twice a week but not daily) in nearly 298 (62.27%) children and 'all days of the week' in another 98 (22.12%) children. Conversely, post-intervention, 295 (66.59%) children now preferred to eat junk food only sometimes (defined as less than or twice a week), which was a significant change ($p < 0.0001$) compared to pre-intervention results. Only 26 (5.87%) children now ate junk food every day of the week.

Before the intervention, the majority of 301 (67.95%) children consumed junk food because of the taste, but post-intervention, almost 80% of junk food intake 369 was either due to occasions or not wanting to cook at home or eat in the mess. The daily intake of cold drinks also decreased significantly from 68 (15%) pre-intervention to less than 6 (2%) post-intervention. A similar observation was noted in children consuming packaged juices, flavoured drinks, and energy drinks.

Initially, most students 302 (60%) did not consider sugar-sweetened beverages, packaged juices, and energy drinks as junk food. However, post-intervention, nearly 369 (83.3%) children agreed that energy drinks and packaged foods were junk food, although the acceptance of other sugary beverages including tea and coffee

as unhealthy food did not show significant improvement. The number of children wishing to undergo routine whole-body check-ups increased from 97 (21.29%) to 267 (60.27%) post-intervention. However, there was not much interest among children to learn more about unhealthy food habits [Table/Fig-2].

	Questionnaire	Responses	Before intervention	After intervention	p-value
1.	How much sugar can you consume per day	10% of total diet	168 (37.92%)	191 (43.11%)	<0.0001
		20% of total diet	146 (32.95%)	165 (37.25%)	
		30% of total diet	54 (12.19%)	77 (17.38%)	
		40% of total diet	16 (03.6%)	07 (1.58%)	
		50% of total diet	59 (13.31%)	03 (0.68%)	
2.	How much oil can you consume per day	10% of total diet	216 (48.76%)	243 (54.85%)	0.0002
		20% of total diet	121 (27.31%)	112 (25.28%)	
		30% of total diet	70 (15.80%)	81 (18.29%)	
		40% of total diet	14 (3.16%)	02 (0.46%)	
		50% of total diet	22 (4.97%)	05 (1.12%)	
3.	How much calorie scan you consume per day	1000	76 (17.15%)	58 (13.09%)	<0.0001
		1000-2000	180 (40.63%)	244 (55.08%)	
		2000-3000	105 (23.70%)	124 (27.99%)	
		>3000	82 (18.51%)	17 (3.84%)	
4.	How much exercise should you do per day	< 30 min	247 (55.75%)	266 (60.05%)	0.629
		1 h	168 (37.92%)	152 (34.31%)	
		2 h	25 (5.64%)	23 (5.19%)	
		3 h	02 (0.45%)	02 (0.45%)	
		4 h	01 (0.22%)	00 (00%)	
5.	Can eating junk food be harmful to you	Yes	306 (69.07%)	421 (95.03%)	<0.0001
		No	137 (30.93%)	22 (%)	
6.	Effects of junk food by increasing weight	Yes	118 (26.64%)	428 (%)	<0.0001
		No	325 (73.36%)	15 (3.39%)	
7.	Effects of junk food by increasing blood pressure	Yes	112 (25.28%)	405 (91.42%)	<0.0001
		No	331 (74.72%)	38 (8.58%)	
8.	Effects of junk food by increasing risk of heart diseases	Yes	123 (27.77%)	418 (94.36%)	<0.0001
		No	320 (72.23%)	25 (5.64%)	
9.	Effects of junk food by increases risk of diabetes	Yes	126 (28.44%)	423 (95.48%)	<0.0001
		No	317 (71.56%)	20 (4.52%)	
10.	Effects of junk food by increases risk of dental caries	Yes	108 (24.38%)	425 (95.94%)	<0.0001
		No	335 (75.62%)	18 (4.06%)	
11.	Effects of junk food by increases risk of vitamin and mineral deficiency	Yes	361 (81.49%)	404 (91.20%)	<0.0001
		No	82 (18.51%)	39 (8.80%)	
12.	Do you like to eat fast/junk food	Sometimes	47 (10.61%)	295 (66.59%)	<0.0001
		Mostly	298 (67.27%)	122 (27.54%)	
		Always	98 (22.12%)	26 (5.87%)	
13.	You like to eat junk food because	It is tasty	301 (67.95%)	53 (11.97%)	<0.0001
		Friends push	28 (6.32%)	34 (7.67%)	
		Don't feel like cooking or eating at home or mess	44 (9.93%)	197 (44.47%)	
		Celebrate occasions	70 (15.80%)	159 (35.89%)	
14.	How much exercise do you do	Never	116 (26.19%)	24 (5.42%)	<0.0001
		Once a week	89 (20.09%)	125 (28.22%)	
		Twice a week	69 (15.58%)	32 (7.22%)	
		More than twice but not daily	60 (13.54%)	111 (25.06%)	
		Daily	109 (24.60%)	151 (34.08%)	
15.	Which type of junk food you like	Home made	147 (33.18%)	93 (20.99%)	<0.0001
		Restaurant based	44 (9.93%)	299 (67.49%)	
		Both	252 (56.89%)	51 (11.51%)	

16.	Do you drink soda/cold drinks	Sometimes	302 (68.17%)	55 (12.42%)	<0.0001
		Often	73 (16.48%)	382 (86.23%)	
		Daily	68 (15.35%)	06 (1.35%)	
17.	Do you drink packaged fruit juices	Sometimes	370 (83.52%)	402 (90.74%)	0.005
		Often	60 (13.54%)	35 (7.90%)	
		Daily	13 (2.93%)	06 (1.36%)	
18.	Do you drink flavoured drinks/package shakes	Sometimes	292 (65.91%)	389 (87.81%)	<0.0001
		Often	142 (32.05%)	51 (11.51%)	
		Daily	09 (2.03%)	03 (0.67%)	
19.	You take tea or coffee	Sometimes	184 (41.53%)	277 (62.53%)	<0.0001
		Daily	113 (25.51%)	98 (22.12%)	
		Often	62 (13.99%)	20 (4.51%)	
		Twice a day	74 (16.71%)	26 (5.87%)	
		More than twice a day	10 (2.26%)	22 (4.96%)	
20.	Do you take energy drinks	Sometimes	162 (36.57%)	409 (92.33%)	<0.0001
		Often	243 (54.85%)	31 (6.99%)	
		Daily	33 (7.45%)	03 (0.68%)	
		More than once a day	05 (1.13%)	0	
21.	Have you ever got your whole body checkup/ routine blood tests done (awareness)	Yes	97 (21.90%)	267 (60.27%)	<0.0001
		No	346 (78.10%)	176 (39.72%)	
22.	Do you wish to learn more about healthy and unhealthy foods	Yes	144 (32.51%)	83 (18.74%)	<0.0001
		No	299 (67.49%)	360 (81.26%)	
23.	Are ready to eat noodles junk food	Yes	199 (44.92%)	388 (87.58%)	<0.0001
		No	244 (55.08%)	55 (12.42%)	
24.	Are jams/sauces/pickles junk food	Yes	79 (17.83%)	371 (83.75%)	<0.0001
		No	364 (82.17%)	72 (16.25%)	
25.	Are energy supplement and milk shakes junk food	Yes	107 (24.15%)	68 (15.34%)	=0.001
		No	336 (75.84%)	375 (%)	
26.	Are cold drinks/sodas junk food	Yes	151 (34.08%)	56 (12.64%)	<0.0001
		No	292 (65.91%)	387 (87.36%)	
27.	Are packaged juices junk food /unhealthy food	Yes	173 (39.06%)	359 (81.04%)	<0.0001
		No	270 (60.94%)	84 (18.96%)	
28.	Are packaged flavoured drinks/shakes junk food/unhealthy food	Strongly disagree	12 (2.71%)	14 (3.16%)	<0.0001
		Disagree	39 (8.80%)	35 (7.90%)	
		Neutral	150 (33.86%)	46 (10.38%)	
		Agree	196 (44.24%)	274 (61.85%)	
		Strongly agree	46 (10.38%)	74 (16.70%)	
29.	Are tea/Coffee junk food/unhealthy food	Strongly disagree	39 (8.80%)	12 (2.71%)	<0.0001
		Disagree	137 (30.93%)	110 (24.83%)	
		Neutral	185 (41.76%)	177 (39.96%)	
		Agree	71 (16.03%)	114 (25.73%)	
		Strongly agree	11 (2.48%)	30 (6.77%)	
30.	Are energy drinks junk food/unhealthy food	Yes	190 (42.89%)	369 (83.30%)	<0.0001
		No	253 (57.11%)	74 (16.70%)	
31.	Is ready to eat cheese slice/salami/nuggets unhealthy food	Strongly disagree	21 (4.74%)	16 (0.04%)	<0.0001
		Disagree	180 (40.63%)	52 (11.74%)	
		Neutral	135 (30.47%)	40 (9.03%)	
		Agree	72 (16.25%)	275 (62.07%)	
		Strongly agree	35 (7.90%)	60 (13.54%)	
32.	Are Indian delicacies rasgulla/halwa/burfi/ladoo junk food/unhealthy food	Strongly disagree	56 (12.64%)	37 (8.35%)	<0.0001
		Disagree	122 (27.54%)	24 (5.42%)	
		Neutral	138 (31.15%)	143 (32.28%)	
		Agree	85 (19.18%)	139 (31.38%)	
		Strongly agree	42 (9.48%)	100 (22.57%)	

[Table/Fig-2]: Changes in response of students before and after intervention [Annexure].

DISCUSSION

Although there are multiple studies on the prevalence and reasons for unhealthy eating, the most common age groups affected, and the side-effects noted with increased junk food intake, Indian studies on the impact of an interventional program in reducing the intake of unhealthy food are grossly lacking for paediatric and adolescent age groups. The only study found from India is a study conducted in Jaipur on school-going children, where researchers noted that an ICT (Information, Communication, and Technology) based educational intervention significantly affected the attitude of school-going children towards junk food consumption and perceived behavioural control towards junk food [15].

To the best of authors knowledge, the present is the first Indian study in the adolescent age group where an educational intervention program has been used to assess changes in awareness and eating habits related to unhealthy food in young medical students. The present study demonstrates a significant positive impact of a 4-week intervention in improving awareness of unhealthy food, including junk foods, and improving behaviours related to the intake of these foods. Cognitive Behavioural Therapy (CBT) is a well known strategy to improve diet and body composition, as evidenced by a study conducted by Tsiros MD et al., [16]. The study showed a significant improvement in weight (CBT 1.9 ± 1.0 kg, control 3.8 ± 0.9 kg, $p=0.001$) and body fat (CBT 1.5 ± 0.9 kg, control 2.3 ± 1.0 kg, $p=0.001$) after a 10-week course of CBT. There was also a reduction in the intake of sugared soft drinks ($p=0.005$) [16].

The results of the present study closely align with a similar study conducted in adolescents in Nepal [17]. The study involved 274 school adolescents where interactive lectures were used as an educational intervention. Pre and post-tests were conducted, and researchers noted that the interactive lecture method was an effective education program for changing the intentions of adolescent students and preventing them from consuming junk food, along with a statistically significant change in behavioural intention, attitude, and perceived behavioural control towards junk food.

In the present study, it was observed that despite being medical students, only 70% of students were aware that junk food can be harmful. Furthermore, most of them were unaware of the side effects of consuming such foods, indicating that knowledge on healthy eating and healthy food should be introduced and practiced regularly from an early age in school. Parents continue to play an important role in this regard as they are the first teachers for these children. They must act as role models before instilling healthy practices in children. It was also noted that many children consumed outside food either due to poor quality of food in the mess or not wanting to cook at home. This issue can be addressed by providing healthier and better-flavoured food for longer hours throughout the day, rather than restricting it only during meal times. By providing these options, the intake of junk food can be restricted, mainly for occasional consumption.

These findings were unlike those noted in a similar study conducted among medical students in North Karnataka, where the author assessed the pattern of fast food or junk food consumption among them. According to their study, 87% of the students were well aware of the side effects of junk food. This difference may be due to the fact that we included students from all years, whereas the other study only included students from two batches who might have already received some training under the MBBS curriculum [5].

In another study conducted among medical students in Patna, a total of 120 students were interviewed to study the consumption of fast food. The study revealed that all the respondents had consumed fast food at some point, with 75% reporting consumption 1-2 times a week. These results were similar to present study, where 70% of the students reported consuming it on most days, defined as more than twice a week but not daily. The baseline knowledge regarding

the ill-effects of junk food intake varied from 50% to 60% based on the disease being questioned, although 88% of the students were aware of the nutritional information of fast food. These results were similar to our study [18].

Furthermore, parents and families also need to understand that home-made delicacies can be unhealthy as they are often high in fat, sugar, and salt. Authors observed a decrease in the post-intervention intake of home-made delicacies. The most likely reason for this change seems to be a lack of knowledge before the intervention, as many people consider home-cooked foods to be entirely healthy. When making a comparative choice, authors should advocate for home-cooked delicacies over outside junk food as they are typically more hygienic and can contain controlled amounts of substances high in fat, salt, and sugar.

Additionally, authors noticed that children did not express interest in learning more about unhealthy foods after a 4-week educational intervention program. This raises concerns that authors may need to combine this program with other more engaging activities and different modes of behavioural intervention.

A major drawback of the study includes the inability to assess the physical and health impact of the behavioural educational program. Although 40% of the children were categorised as overweight, logistical issues prevented the assessment of blood pressure and other health parameters before and after the intervention. It was also noted that longer duration studies were conducted where health parameters were monitored [19].

In one such study conducted in two phases (17 months and 11 months in duration), 1046 adolescents from 20 schools were analysed. Participants from the intervention group consumed lower quantities of unhealthy snacks (-23.32 g; 95% CI: -45.25 , -1.37) and less added sugar (-5.66 g; 95% CI: -9.63 , -1.65) at the end of the trial. Waist circumference was also lower in the intervention group at the end of the program.

Understanding the need for longer interventional programs to observe effective impacts on health and behaviour, we should conduct more studies over extended durations where intervention programs are more participant-friendly and acceptable. There are limited studies assessing the effect of educational interventions in decreasing the intake of junk foods. Educational and behavioural interventions should start at an early age and continue into adulthood to reduce the risk of metabolic disorders and other adverse effects of junk food intake.

Limitation(s)

The limitation of the present study was limited to medical students and was conducted for a short duration, so the physical effects of the educational intervention could not be studied.

CONCLUSION(S)

It can be concluded that short educational intervention programs, as part of CBT have a significant impact on improving awareness and reducing the intake of unhealthy foods, including junk food. More studies of longer duration and involving other components of CBT should be conducted to assess their impact on physical and mental health. Various government and private schools and colleges should promote healthy eating by educating the students and providing facilities for healthy food and safe water.

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